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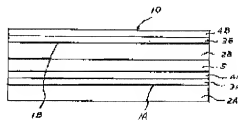
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(54) CARD TYPE HOLOGRAM RECORDING MEDIUM AND ITS REPRODUCING DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To make it possible to prevent not only alternation but forgery as well by providing a card type recording medium to be recorded by holograms with plural information recording surfaces in the thickness direction and recording information on the respective information recording surfaces.

SOLUTION: A substrate 2A transparent with respect to reproducing light, the information recording surface 1A consisting of the hologram, a recording layer 3A, a protective layer 4A, a transparent resin layer 5, a substrate 2B, the information recording surface 1B consisting of the hologram, a recording layer 3B and a protective layer 4B, are successively laminated. The information recording surfaces 1A, 1B are directly inscribed on the substrates 2A, 2B like heretofore or are transferred by a UV curing resin, etc. The surface of the protective layer 4B is subjected to label printing at need. If this constitution is subjected to peeling for the purpose of forgery, the information recording surface 1B is exposed. Even if, however, a card is manufactured by executing physical transfer from this surface, the card has only the information recording surface 1B and, therefore, the card having just part of the recording information is completed.



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CLAIMS

[Claim(s)]

[Claim 1] The card mold hologram record medium characterized by having the 2nd [or more] page of the information recording surface which is the card mold hologram record medium which can be read by the irradiated reflected light or the transmitted light of light, and was recorded on the hologram covering the thickness direction, and consisting of a substrate, a recording layer, a transparence resin layer, the 2nd recording layer, and a protective layer at least.

[Claim 2] The card mold hologram record medium according to claim 1 characterized by having divided the digital signal data showing the information for one or more into two in the unit smaller than the amount of data recordable on the 1st page of said information recording surface, and dividing and recording this divided digital signal data on a different information recording surface of the 2nd [or more] page as the information recorded on each information recording surface becomes discontinuous.

[Claim 3] The card mold hologram record medium according to claim 1 characterized by having divided into the key information for determining the decryption approach of the main data which enciphered and generated digital signal data, and this main data, and recording this main data and key information on a mutually different information recording surface.

[Claim 4] The card mold hologram record medium according to claim 3 characterized by having recorded said key information on recording surfaces other than a surface among two or more information recording surfaces, and recording the main data on a surface recording surface.

[Claim 5] The card mold hologram record medium according to claim 1 characterized by recording the 2nd truth-or-falsehood judging code which carried out function processing and obtained the 1st truth-or-falsehood judging code and said 1st truth-or-falsehood judging code on a mutually different information recording surface.

[Claim 6] The card mold hologram record medium according to claim 5 characterized by having recorded the 1st truth-or-falsehood judging code on recording surfaces other than a surface side among two or more information recording surfaces, and recording said 2nd truth-or-falsehood

judging code on a surface recording surface.

[Claim 7] The card mold hologram record medium according to claim 1 to 6 characterized by making all the surface all [a part or] into a postscript field.

[Claim 8] The card mold hologram record medium according to claim 1 to 6 characterized by making all recording surfaces other than a surface recording surface into the field only for playbacks.

[Claim 9] The digital signal data showing the information for one are divided or more into two in a unit smaller than the amount of data recordable on the 1st page of said information recording surface. It is the regenerative apparatus of the card mold hologram record medium which divided and recorded this divided digital signal data on a different information recording surface of the 2nd [or more] page as the information recorded on each information recording surface becomes discontinuous. The regenerative apparatus of the card mold hologram record medium characterized by reading the digital signal data divided and recorded on said different information recording surface of the 2nd [or more] page, restoring to the original digital signal data, and reproducing said information.

[Claim 10] It divides into the main data which enciphered and generated digital signal data, and the key information for determining the decryption approach of this main data. It is the regenerative apparatus of the card mold hologram record medium which recorded this main data and key information on a mutually different information recording surface. After reading said key information and determining the decryption approach, said main data currently recorded on a different information recording surface from this key information are read. The regenerative apparatus of the card mold hologram record medium characterized by restoring said main data to the original digital signal data based on said determined decryption approach, and reproducing said information.

[Claim 11] It is the regenerative apparatus of the card mold hologram record medium which recorded the 2nd truth-or-falsehood judging code which carried out function processing and obtained the 1st truth-or-falsehood judging code and said 1st truth-or-falsehood judging code on a mutually different information recording surface. Reproduce said 1st truth-or-falsehood judging code, and said 2nd truth-or-falsehood judging code is reproduced continuously. Then, the regenerative apparatus of the card mold hologram record medium characterized by collating said 1st reproduced truth-or-falsehood judging code with said 2nd truth-or-falsehood judging code which carried out function processing, and which was reproduced continuously, and judging truth or falsehood.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the card mold hologram record medium which

the information recorded especially cannot forge easily, and its regenerative apparatus about a card-like hologram record medium.

[0002]

[Description of the Prior Art] Conventionally, generally the record medium of the shape of various a card has spread widely from portable goodness and the simplicity of treatment so that it may be represented by the magnetic card. How a magnetic card is used serves as an important medium at the time of treating individual information and money, such as an individual ID card, a credit card, and various prepaid cards for service. Although the IC card and the optical card were late for the magnetic card and it was developed, since mass information is recordable, much goods proposals are made in recent years, and the part in it is put in practical use.

[0003]

[Problem(s) to be Solved by the Invention] Now, the application which also records critical information on these media has increased with the above mentioned high-performance-izing of the spread of card-like record media, and the latest computer. However, although the problem of the security for preventing that a third party uses the recorded information illegally, embezzling, altering or forging is not fully solved, it is good.

[0004] For example, it can perform comparatively easily that a magnetic card etc. eliminates or rewrites the information currently recorded on the principle of the record approach of the information. Recently, the alteration article which altered the information to which magnetic recording of the prepaid cards, such as a telephone card and an orange card of JR, was carried out has also appeared on the market considerably, and the amount of damage has also social-problem-ized it greatly. Thus, the actual condition is that the card system using magnetic recording does not have a leading method of opposing an alteration article and a counterfeit.

[0005] Then, the card mold optical recording medium which made it the principle for magnetic-card glue to read the information beforehand formed with the groove or a minute concavo-convex pattern like a pit on the substrate using an echo or transparency of light is devised. Especially the card that adopted the hologram as the minute concavo-convex pattern, and was considered as reflective mold read-out is made high [secrecy nature]. Rewriting with this type of reversible card was not performed, but the approach of rewriting information by destroying a hologram mechanically or thermally is adopted. Since it is not reversible rewriting, the so-called unauthorized use of an altered prepaid card can be opposed.

[0006] This card 11 is having structure like drawing 1 . That is, the laminating is carried out to the order of the information recording surface 1 and recording layer 3 which consist of a transparent substrate 2 and a hologram, and a protective layer 4 to the wavelength of playback light. The information recording surface 1 is directly stamped on the previous substrate 2, or is imprinted with ultraviolet-rays hardening resin etc. Moreover, label printing may be performed on the protective layer 4.

[0007] However, since this card mold optical recording medium has comparatively the hologram on which information was recorded near the surface while it has the advantage of point **, a surface protective layer etc. can be removed, a hologram can be exposed and a card with the

same information as a normal article can be forged by carrying out imprint reproduction of that irregularity physically. When such an approach is used, since two or more same cards can completely manufacture, in the case of a PURIPEDO card, it may become immense damage from an intact card. Although the approach of making an illegal copy article an invalid can be variously devised in hard, the cost of a reader becomes high, and many steps for a truth-or-falsehood check will be added, and the burden to a registered user will also become large. This invention is made paying attention to the trouble of the above-mentioned conventional technique, and it aims at offering the card mold hologram record medium which cannot forge, and its regenerative apparatus.

[0008]

[Means for Solving the Problem] In order to attain the above-mentioned object, the invention in this application is the card mold hologram record medium which can be read by the irradiated reflected light or the transmitted light of light. It has the 2nd [or more] page of the information recording surface recorded on the hologram covering the thickness direction. The card mold hologram record medium which consists of a substrate, a recording layer, a transparence resin layer, the 2nd recording layer, and a protective layer at least Moreover, the digital signal data showing the information for one are divided or more into two in a unit smaller than the amount of data recordable on the 1st page of said information recording surface. It is the regenerative apparatus of the card mold hologram record medium which divided and recorded this divided digital signal data on a different information recording surface of the 2nd [or more] page as the information recorded on each information recording surface becomes discontinuous. The digital signal data divided and recorded on said different information recording surface of the 2nd [or more] page are read. The regenerative apparatus of the card mold hologram record medium which reverts to the original digital signal data and reproduces said information Moreover, the main data which enciphered and generated digital signal data, It is the regenerative apparatus of the card mold hologram record medium which divided into the key information for determining the decryption approach of this main data, and recorded this main data and key information on a mutually different information recording surface. After reading said key information and determining the decryption approach, said main data currently recorded on a different information recording surface from this key information are read. The regenerative apparatus of the card mold hologram record medium which restores said main data to the original digital signal data based on said determined decryption approach, and reproduces said information Moreover, the 1st truth-or-falsehood judging code, It is the regenerative apparatus of the card mold hologram record medium which recorded the 2nd truth-or-falsehood judging code which carried out function processing and obtained said 1st truth-or-falsehood judging code on a mutually different information recording surface. Reproduce said 1st truth-or-falsehood judging code, and said 2nd truth-or-falsehood judging code is reproduced continuously. Then, the regenerative apparatus of the card mold hologram record medium which collates said 1st reproduced truth-or-falsehood judging code with said 2nd truth-or-falsehood judging code which carried out function processing, and which was reproduced continuously, and judges truth or

falsehood is offered, respectively.

[0009]

[Embodiment of the Invention] The description of the card mold hologram record medium of this invention shall have the 2nd [at least] page of the information recording surface recorded on the hologram, and one [at least] of them shall be arranged near the front face. Although explanation is given using drawing below, in order to help an understanding, the number of information recording surfaces shall be two. However, it does not restrict to this and is good also considering it as 3rd [or more] page. Moreover, in order to help an understanding similarly, the independent separate data A and B shall be recorded. However, it does not restrict to this, and it is good also as record of Data A, and data other than A and B may be recorded.

[0010] Example 1 drawing 2 is the sectional view showing the fundamental configuration of the optical card 10 which becomes this invention. The laminating is carried out to the order of transparent substrate 2A, information recording surface 1A which consists of a hologram, recording layer 3A, protective layer 4A, the transparence resin layer 5, substrate 2B, information recording surface 1B that consists of a hologram, recording layer 3B, and protective layer 4B to the wavelength of playback light. Like the conventional example, the information recording surfaces 1A and 1B are directly stamped on the previous substrate 2, or are imprinted with ultraviolet-rays hardening resin etc. Moreover, on protective layer 4B, label printing is performed if needed.

[0011] In such a configuration, when it exfoliates for the purpose of forgery, information recording surface 1B is exposed. However, even if it performs an imprint more nearly physical than this field and manufactures a card, since it has only information recording surface 1B with it, the card which has only a part of those recording information is done. That is, the same card which has the 2nd [or more] page of an information recording surface in the thickness direction is not made, but turns into a low card of value. thus -- this invention -- forgery can be prevented by using a hologram card.

[0012] Next, the ingredient which constitutes a card is explained. When it can be used to playback wavelength if substrate 2A and 2B are transparent, for example, using 780nm of infrared radiation, and 630nm of red light for playback light, they are synthetic resin, such as the polycarbonate which is a transparent ingredient over the light from infrared radiation, polystyrene, a polycarbonate polystyrene copolymer, polymethylmethacrylate, polyvinyl chloride, alicyclic polyolefine, and the poly methyl pentene, quartz glass, soda lime glass, the soda alumino silica glass that carried out the chemical strengthening, etc. The laminating of these ingredients may be carried out from the object of enhancement on the strength if needed. Especially suitable things are a polycarbonate, and polymethylmethacrylate and alicyclic polyolefine. In addition, thermosetting resin, radiation-curing resin (the light, ultraviolet rays, electron ray hardening resin, etc. are included), 2 liquid hardening type reaction hardenability resin, etc. can be used.

[0013] 0.02-1.2mm is the optimal as thickness, and its 0.04-0.8mm is especially desirable. The hologram card which will be easy to use it in human engineering if it chooses so that the sum

total thickness which set two substrates may be set to 0.5-1.2mm (the comprehensive thickness as a card containing other layers is also almost the same), is easy to carry out preservation and a cellular phone, and is hard to lose can be obtained. By injection molding, compression molding, cast shaping, 2P shaping, etc., these substrates form information recording surface 1A and 1B, and are offered.

[0014] As an ingredient used for recording layer 3A or 3B, gold with the function only for playbacks, silver, copper, iron, aluminum, chromium, titanium, molybdenum, silicon, a tantalum, nickel, etc. and these alloys (an oxide, a nitride, and carbide are included) are used, and 5-150nm is chosen as thickness. Among these, there is a metal membrane which contains chromium as an ingredient which is excellent in an adhesive property. Adhesive strength is the highest, and in other words, the forged prevention effectiveness of the recording layer which contains chromium 50% or more is also the highest. In addition, this card can cross recording surfaces 1A and 1B to the whole surface, can write in information, and a coordinate is the same and it is possible also for arranging information so that recording surfaces may differ. Since recording layer 3A etc. will be spaced in such a configuration and it will read information side 1B, recording layer 3A is transposed to a translucent ingredient. For example, what is necessary is just to consider as 15nm layer of aluminum 9nm layer metallurgy, a silicon carbide 50nm layer, etc.

[0015] As protective layer 4A or 4B, thermosetting resin, radiation-curing resin (the light, ultraviolet rays, electron ray hardening resin, etc. are included), 2 liquid hardening type reaction hardenability resin, thermoplastics, etc. are mentioned. Hardening contraction of especially a suitable thing is 10% or less of light hardening resin, and ultraviolet-rays hardening resin. It is chosen out of the monomer which has the partial saturation ester bond of six organic functions from monofunctional as an example of representation, and the constituent with which the light mold photoinitiator or the ultraviolet-rays mold photoinitiator was mixed 0.1 to 10% is stiffened. Although, as for thickness, 2-15 microns is chosen, especially a suitable thing is 5-10 microns.

[0016] Thermosetting resin, radiation-curing resin (the light, ultraviolet rays, electron ray hardening resin, etc. are included), 2 liquid hardening type reaction hardenability resin, thermoplastics, etc. can be used for the transparence resin layer 5, and especially a suitable thing is the light hardening resin and ultraviolet-rays hardening resin with which hardening contraction has 6% or less of adhesiveness. The monomer which has two organic functions and/or a monofunctional partial saturation ester bond as an example of representation is made to harden the constituent which mixed the light mold photoinitiator or the ultraviolet-rays mold photoinitiator 0.1 to 10%. Moreover, the thermoplastics which has adhesiveness can also be used preferably.

[0017] Although, as for thickness, 2-80 microns is chosen, especially a suitable thing is 5-50 microns. The resin layer which used as the principal component the acrylate monomer and methacrylate monomer which have 2 organic-functions partial saturation ester bond, was made to harden the constituent which mixed the ultraviolet-rays mold photoinitiator 0.1 to 10%, and has the strong adhesiveness of 5% or less of hardening contraction is most excellent. When thickness is made into 5-15 microns, adhesive strength is the highest, and in other words, this

transparence resin layer serves as resin also with the highest forged prevention effectiveness.

[0018] In addition, since the transparence resin layer 5 can also give functions other than adhesion, it should have the function of a protective layer, for example, and protective layer 4A becomes unnecessary in that case. Moreover, it should have the information side imprint nature which is the function of substrate 2B, for example, separability, and transparency, and substrate 2B becomes unnecessary in that case. Moreover, if the transparence resin layer 5 has both the functions of 2B and 4A, 2B and 4A will become unnecessary. In other words, this invention can also consist of minimums from a substrate, a recording layer, a transparence resin layer, the 2nd recording layer, and the 2nd protective layer.

[0019] Since only the information on surface information recording surface 1B is reproduced, the card of example 2 example 1 will not record important information on a surface, but will record information important for information recording surface 1A which is the depths on it. However, although it can respond when the significance of the information to record can expect beforehand then, it may change at the early stages of the beginning of using, and a telophase. In such a case, it is possible to elaborate the signal recorded on the 2nd page and to deal with it. That is, the digital signal data showing the information for one are divided or more into two in a unit smaller than the amount of data recordable on the 1st page of an information recording surface, and this divided digital signal data is divided and recorded on a different information recording surface of the 2nd [or more] page as the information recorded on each information recording surface becomes discontinuous.

[0020] If it explains using drawing 3 , an axis of abscissa will show the longitudinal direction of the hologram train recorded on a card, for example, will go to a right hand from the left, and will be recorded or reproduced in order in this drawing. This example shows that a record section is located in the range of 0-35mm of coordinates. Moreover, the lengthwise direction shows two information recording surfaces. As shown in this drawing, in this example, the digital signal data (it is only hereafter indicated as data) A and B showing the information for one are divided or more into two in a unit smaller than the amount of data recordable on the 1st page of an information recording surface, and it divides and records that the information currently recorded on each information recording surface becomes discontinuous on a different information recording surface of the 2nd [or more] page.

[0021] Therefore, Data A and Data B will be intermingled in one information recording surface in fragments, and will be recorded on it. In this drawing Data A 0-10mm (record section 1-1) of coordinates of the 1st information recording surface, It is divided and recorded on 10-25mm (record section 2-2) of coordinates of the 2nd information recording surface, 25-30mm (record section 1-3) of coordinates of the 1st information recording surface, and 30-35mm (record section 2-4) of coordinates of the 2nd information recording surface by A-1, A-2, A-3, and A-4. Data B 0-10mm (record section 2-1) of moreover, coordinates of the 2nd information recording surface, It is divided and recorded on 10-25mm (record section 1-2) of coordinates of the 1st information recording surface, 25-30mm (record section 2-3) of coordinates of the 2nd information recording surface, and 30-35mm (record section 1-4) of coordinates of the 1st

information recording surface by B-1, B-2, B-3, and B-4.

[0022] The memory of for example, a card high-order end, the right end, or a regenerative apparatus etc. records the record positional information (coordinate information and address information) on which these data A and B are recorded on the position defined beforehand. What is necessary is just to refer to this, in reproducing. thus, even if it copied each information recording surface of the recorded hologram card the whole round head, Data A and B were intermingled in fragments -- moreover -- A and B -- since the meaningless thing which cannot complete single data anyway will be produced, forgery can be prevented.

[0023] An example 3, next the 3rd example of this invention are explained. Drawing 4 is drawing for explaining the signal record approach of the 3rd example of this invention. As shown in this drawing, in this example, the point which each of the data A and B which should be recorded is enciphered based on the key information A and B corresponding to each, and is recorded on each information recording surface on a hologram card differs from the above-mentioned hologram card. That is, the data which should be recorded are divided and recorded on the main data and key information which were enciphered and generated based on key information. At this time, the key information A on Data A is recorded on the data storage area 1-2 of the 1st information recording surface 1, and the main data B1 which enciphered and generated Data B are recorded on a data storage area 1-1.

[0024] Moreover, key information B-2 is similarly recorded on the data storage area 2-2 of the 2nd information recording surface 2, and the main data A1 are recorded on a data storage area 2-1. That is, the key information and the main data of the same origin are made not to be recorded on the same information recording surface. As long as it keeps this principle, also in an optical disk which has the 3rd [or more] page of an information recording surface, key information and the main data may be installed in the coordinate of arbitration that what is necessary is just to arrange to the information recording surface of arbitration. Moreover, it is also possible for neither key information nor the main data to necessarily continue uniformly, for example, to halve key information B-2 to B-2 -1 and B-2 -2, to record 25-30mm of coordinates and key information B-2 -2 for key information B-2 -1 on 30-35mm of coordinates, and to use except [its] as the main data A.

[0025] The main data A1 and B1 of the above-mentioned data A and B and the key information A2, and B-2 are recorded with the recording device 40 as shown in drawing 5 . In this drawing, 41 is an encryption means 41 to encipher Data A and B based on key information, 42 is the master data record means 42 for recording the main data A1 and B1 which enciphered Data A and B with the encryption means 41, and were generated on the information recording surface of an optical disk, and 43 is the key information record means 43 for recording the above-mentioned key information A2 and B-2.

[0026] Next, actuation of the above-mentioned recording device 40 is explained. If Data A and B are inputted into the encryption means 41, with the encryption means 41, Data A and B will be enciphered using the key information A2 or B-2 corresponding to each of Data A and B. As the approach of this encryption, data are divided into an every several bits group, and what shifts

each several bits bit at a time to the right or the left within that group can be considered, for example. moreover, dividing Data A and B into an every several bits group, and setting beforehand the encryption regulation for encryption of shifting each several bits bit at a time to the right or the left within that group to the encryption means 41 among this encryption approach, and making a what bit group divide using key information -- or the constant-information what bit shift is carried out is given.

[0027] Thus, with the encryption means 41, Data A and B are enciphered using the key information A2 and B-2, the main data A1 and B1 are generated, and it outputs to the master data record means 42. With a master data record means 42 by which these main data A1 and B1 were inputted, it records similarly with recording data on the conventional hologram card. At this time, the main data A1 are recorded on the data storage area 2-1 of the 2nd information recording surface 2, and record the main data B1 on the data storage area 1-1 of the 1st information recording surface 1. Moreover, the above-mentioned key information A2 and B-2 are inputted also into the key information record means 43 with the encryption means 41. With this key information record means 43, the key information A2 is recorded on the key information record section 1-2 of the 1st information recording surface 1, and key information B-2 is recorded on the key information record section 2-2 of the 2nd information recording surface 2. It becomes possible to produce the hologram card with which the main data enciphered based on key information and key information as mentioned above were recorded.

[0028] Thus, the created hologram card cannot generate Data A and B from the main data A1 and B1, if the encryption approach from Data A and B to the original main data A1 and B1 is not decoded. In addition, since it becomes difficult to decode the decryption approach so that the encryption approach is complicated, of course, the effectiveness of protecting the recorded data from a vicious illegal copy becomes high. The difficult public key encryption of the decode represented by RSA cryptograph etc. is suitable for this. From the limit of a digit count recorded on a card especially, the elliptic curve cryptosystem using a cubic function and especially the hyperelliptic curve function more than using the fourth high order function are suitable.

[0029] Example 4 example 2 divides and records data, and the example 3 was what enciphers and records data. Although all have the high forged prevention effectiveness, the processing circuit of data is needed. Next, the forged prevention approach which makes these circuits unnecessary is explained. In this example, the truth-or-falsehood judging code for judging a genuine article or imitation is prepared two kinds, for example, and let one of them be the 1st truth-or-falsehood judging code X. And the 2nd truth-or-falsehood judging code Y which cooperated with the 1st truth-or-falsehood judging code X is prepared. Data A and the 1st truth-or-falsehood judging code X are recorded on information recording surfaces other than a surface, and record Data B and the 2nd truth-or-falsehood judging code Y on a surface information recording surface.

[0030] In the example shown in drawing 6 , Data A are recorded on a field 1-1, and record the 1st truth-or-falsehood judging code X on a field 1-2. Data B are recorded on a field 2-1, and record the 2nd truth-or-falsehood judging code Y on a field 2-2. Although the gestalt which is

easy to forge has been taken since especially the data A or B were not processed, it considers as the regenerative apparatus on condition of reading the field 1-2 which recorded the truth-or-falsehood judging code in reading, and a field 2-2. That is, at the time of reading, the truth-or-falsehood judging codes X and Y are required for a separate information recording surface. Moreover, it is also required whether X and Y have predetermined relation and to check and to pass it. Thus, the recorded information has the forged prevention effectiveness and cannot be read with the card which forged only the surface.

[0031] Next, a recording device 50 is explained with reference to drawing 7. In this example, while preparing the 1st truth-or-falsehood judging code X beforehand, Function f is prepared. When X is inputted, this function $f(X)$ is a function which computes the becoming value, for example, is so-called $f(X) = X^2 + 5X + 3$. It is $f(X) = X$ most simply. These are inputted into the function processing means 51. When the truth-or-falsehood judging code X is a numeric value, it can input as it is, and from the function processing means 51, the 2nd truth-or-falsehood judging code Y is outputted.

[0032] Code Y serves as a numeric value of $Y = X^2 + 5X + 3$ here. Moreover, when Code X is an alphabetic character, this is evaluated and (not shown) inputted by the well-known evaluation approaches -- for example, it is made (contrast with a JIS code chart). And with the same means, function count is performed, and it outputs as it is, or iteration is again carried out with a JIS code chart etc. These results are sent to the code record means 53, perform processing required in order to record on the information recording surface of a hologram card, and record Code Y on a field 2-2.

[0033] Moreover, Code X is sent to the code record means 52, performs processing required in order to record on the information recording surface of a hologram card, and records Code X on a field 1-2. In addition, Data A and B are recorded with a well-known record means. It becomes possible to produce the hologram card with which two truth-or-falsehood judging codes and data were recorded as mentioned above.

[0034] Thus, if a truth-or-falsehood judging code cannot read the created hologram card in two different information recording surfaces, it cannot read Data A and B, and it can protect the data recorded since Data A and B could not be pulled out if two codes did not fill the relation given with the predetermined function f from a vicious illegal copy. Moreover, since Data A and the B itself do not need to process it according to this approach, there is also an advantage that a record circuit and a regenerative circuit are easy and end. That is, the buffer memory which keeps temporarily all or some of data A and B is unnecessary, and the effectiveness is demonstrated for data with a larger capacity. next -- this invention -- the application of a hologram card is explained paying attention to a mainly physical configuration.

[0035] Example 5 drawing 8 is an example of the hologram card which the 2nd page of the information recording surfaces 1A and 1B has, and is the explanatory view of the example applied to a PURIPEDO card. The laminating is carried out to the order of substrate 2B by which hologram 7B on which information was recorded by substrate 2A by which hologram 7A on which information was recorded by injection molding was imprinted, recording layer 3A, the

transparence [a protective layer-cum-] resin layer 5, and sheet compression molding was imprinted, recording layer 3B, protective layer 4B, and the printing layer 6. The thickness of substrate 2A is 0.6mm, and although 780nm of playback light is transparent, they uses for people's eye the special polycarbonate W820 recognized black. Moreover, substrate 2B is a transparence polycarbonate sheet and thickness is 0.05mm. Recording layer 3A is the pure chromium 50nm film, and recording layer 3B is the pure aluminum 70nm film.

[0036] The transparence [a protective layer-cum-] resin layer 5 used as the principal component the acrylate monomer and methacrylate monomer which have 2 organic-functions partial saturation ester bond, stiffened the constituent which mixed the ultraviolet-rays mold photoinitiator about 3%, is 4% of hardening contraction, and is 10-micron thickness. Moreover, protective layer 4B used as the principal component the acrylate monomer which has 2 organic-functions partial saturation ester bond, stiffened the constituent which mixed the ultraviolet-rays mold photoinitiator about 5%, is 10% of hardening contraction, and has become 8-micron thickness. Moreover, the printing layer 6 serves as 8-micron thickness in the commercial black coatings.

[0037] Hologram 7A which hologram 7B which constitutes information recording surface 1B here constitutes a surface recording surface, and constitutes information recording surface 1A constitutes the depths recording surface. In addition, although two information recording surfaces are parallel, the coordinate of Holograms 7A and 7B does not lap, and is not formed in the coordinate with which recording layer 3A accompanying a hologram is also equivalent to hologram 7B. In addition, on information recording surface 1A, a several bits truth-or-falsehood judging code is recorded, and it carries out only to playbacks at it. Moreover, the several bits 2nd truth-or-falsehood judging code is recorded on 1B, and this field is made only into for playbacks, and makes the remaining fields the postscript information field which records the balance etc. Thus, if constituted, it does not move in the thickness direction, and ** can also read a two-layer hologram and the pickup in a regenerative apparatus can simplify equipment. Moreover, a card also has the advantage that it is black even if it watches from which, and the structure of this card cannot be viewed. Moreover, the truth-or-falsehood judging code is recorded on both layers, and there is the forged prevention effectiveness. Thus, this configuration is a configuration of having been suitable for the PURIPEDO card.

[0038] Example 6 drawing 9 is an example of the hologram card which the 2nd page of the information recording surfaces 1A and 1B similarly has, and is an example applied to a PURIPEDO card. The laminating of the holograms 7A and 7B on which information was recorded by raw sheet substrate 2A, the transparence [a protective layer-cum-] resin layer 5, recording layer 3A, and injection molding is carried out to the order of substrate 2B by which the double-sided imprint was carried out, recording layer 3B, protective layer 4B, and the printing layer 6. The thickness of substrate 2A is 0.1mm, and although 780nm of playback light is transparent, they uses for people's eye the polycarbonate sheet which blended the special color recognized black. Moreover, substrate 2B is a polycarbonate W820 and thickness is 0.5mm. Recording layers 3A and 3B are both pure chromium 50nm film.

[0039] The transparency [a protective layer-cum-] resin layer 5 used as the principal component the acrylate monomer and methacrylate monomer which have 2 organic-functions partial saturation ester bond, stiffened the constituent which mixed the ultraviolet-rays mold photoinitiator about 3%, is 4% of hardening contraction, and is 10-micron thickness. Moreover, protective layer 4B used as the principal component the acrylate monomer which has 2 organic-functions partial saturation ester bond, stiffened the constituent which mixed the ultraviolet-rays mold photoinitiator about 5%, is 10% of hardening contraction, and has become 8-micron thickness. Moreover, the printing layer 6 serves as 8-micron thickness in the commercial black coatings.

[0040] Hologram 7A which hologram 7B which constitutes information recording surface 1B here constitutes a surface recording surface, and constitutes information recording surface 1A constitutes the depths recording surface. In addition, although two information recording surfaces are parallel, the coordinate of Holograms 7A and 7B does not lap, and is not formed in the coordinate with which recording layer 3A accompanying a hologram is also equivalent to hologram 7B. In addition, on information recording surface 1A, a several bits truth-or-falschood judging code is recorded, and it carries out only to playbacks at it. Moreover, the several bits 2nd truth-or-falschood judging code is recorded on 1B, and this field is made only into for playbacks, and makes the remaining fields the postscript information field which records the balance etc.

[0041] Thus, if constituted, about [inheriting the advantage of drawing_8 as it is] and manufacture can be simplified. That is, in this case, although shaping and recording layer membrane formation had to be twice performed in drawing_8 , since it is double-sided shaping primarily, shaping can be managed at a time. Moreover, there is also a double-sided type thing depending on membrane formation equipment, and if this is used, membrane formation can also be managed at a time. Thus, this configuration is a configuration of having been suitable for manufacturing a PURIPEDO card cheaply.

[0042] the above -- this invention -- the example of a hologram card has been explained. These are explanation to show the basic frame of invention, and this invention is not limited to this. The example shown with the drawing is possible also for changing a component to each other, and possible also for exchanging for another component indicated in the text. Moreover, each device is good for altitude also as a complicated thing in consideration of the convenience of a user, a card contractor, and a card reader contractor. A component may be changed according to the utilization object and the configuration itself may be combined. For example, drawing_9 may transpose this part to the substrate with which double-sided shaping of the hologram was carried out, although one side is a raw substrate (substrate 2A).

[0043] Next, the regenerative apparatus of the hologram card which becomes drawing_3 is explained. Drawing_10 is drawing showing the configuration of the important section of a regenerative apparatus roughly. In this drawing, 10 is the hologram card 10 explained by above-mentioned drawing_3 , has two information recording surfaces 1T and 2T in the thickness direction, and has intermingled for them and recorded them on each of each information recording surface in the data A and B divided like drawing_3 (in this drawing_10 , a simple

indication of that detail configuration is given for convenience). Moreover, reading appearance of the information recorded on the hologram card 10 is optically carried out by CCD21, and it is changed into electrical signals, such as a regenerative signal, through the head amplifier circuit 22. These electrical signals are sent to a digital disposal circuit 23, and are changed and outputted to digital data. In addition, playback of each information recording surface in the hologram card 10 is performed by the well-known focusing technique. That is, since each information recording surface separates fixed spacing and is arranged at parallel, it can double a focus to the information recording surface it was determined beforehand that moved CCD21 up and down, and can perform playback to it without difficulty.

[0044] If the hologram card 10 is set in the above-mentioned regenerative apparatus 20, the hologram card set detector 24 will send a detecting signal to a microcomputer 25. The carrier beam microcomputer 25 carries out horizontal migration of the hologram card 10 for a detecting signal using the hologram card actuator 27, and the data which controlled the CCD actuator 26 further and was recorded on the hologram card 10 using CCD21 is reproduced. Since it is stored in memory 25A prepared in the interior of a microcomputer 25 (or exterior), based on this record positional information, how and where Data A and B are divided and it is recorded outputs a hologram card control signal to the hologram card actuator 27, and it outputs a CCD control signal to the CCD actuator 26. Based on the CCD control signal from a microcomputer 25, the change of the 1st or 2nd information recording surface is controlled by the CCD actuator 26 here. That is, when reproducing Data A, A-1 recorded on the above-mentioned record section 1-1 considering the focal location of CCD as the 1st information recording surface 1T is reproduced first. And if it becomes a predetermined coordinate location, A-2 recorded on the above-mentioned record section 2-2 considering the focal location of CCD as the 2nd information recording surface 2T will be reproduced. Hereafter, each information is reproduced similarly.

[0045] In addition, although [this example / a reading division of two information layers] vertical movement of CCD performs, it does not restrict to this, and CCD is immobilization and you may make it move the hologram card 10 up and down. Moreover, although [record positional information] beforehand recorded on memory 25A of a regenerative apparatus 20, it is not limited to this. For example, they are written in the specific location with the hologram card 10, and it is read first, and it is made to write in memory 25A, or you may carry out.

[0046] Next, the regenerative apparatus of the hologram card 10 which recorded the signal like the example of drawing 4 is explained. Drawing 11 is drawing showing roughly the configuration of the important section of the regenerative apparatus which reproduces the hologram card 10 shown in drawing 4. The main data read means 61 for a regenerative apparatus 60 to read the above-mentioned main data A1 and B1 in the data storage area of the hologram card 10, as shown in this drawing, It consists of RAM64 which stores the decryption approach determined as the key information read means 62 for reading the above-mentioned key information A2 and B-2 in a key information record section, and the key information A2 and a decryption means 63 to decrypt the main data A1 and B1 based on B-2, and to reproduce the

above-mentioned data A and B. And Data A are restored from the key information A2 recorded on the main data A1 and the 1st information recording surface 1 which were recorded on the 2nd information recording surface 2, and Data B are restored from key information B-2 recorded on the main data B1 and the 2nd information recording surface 2 which were recorded on the 1st information recording surface 1.

[0047] Next, actuation of a regenerative apparatus 60 is explained. First, the key information A2 and B-2 which were recorded on the hologram card 10 are read by the key information read means 62, and are outputted to the decryption means 63, the key information A2 and a decryption means 63 by which B-2 was inputted -- first -- the key information A2 and B-2 -- Data A and B -- it is alike, respectively and the corresponding decryption approach is determined. Here, the decryption regulation for decoding each of the main data A1 and B1 by which encryption was carried out [above-mentioned] is set to the decryption means 63. It divides for example, the main data into a group, and seems to say that it shifts b bits of each bit in the group at a time to c (right or left). The decryption approach is determined by applying $a=4$, $b=1$, and $c=$ right to this decryption regulation using the key information by which the input was carried out [above-mentioned]. And the decryption approach is determined about each of the main data A1 and B1, and it stores in RAM64 as the decryption approach of the main data A1 or the main data B1.

[0048] Next, if the decryption approach is determined by the decryption means 63, by the main data read means 61, the main data A1 recorded on the data storage area of the hologram card 10 or B1 will be read, and this read main data will be outputted to the decryption means 63. With a decryption means 63 by which the main data were inputted, the main data inputted are decoded based on the decryption approach by which a decision was made [above-mentioned]. That is, when it decodes based on the decryption approach of the main data A1 stored in RAM64 when the main data A are read and the main data B are read, it decodes based on the decryption approach of the main data B1 stored in RAM64. Thus, it restores to the original data from the recorded main data, and outputs as a regenerative signal.

[0049] Next, the regenerative apparatus of the hologram card 10 which recorded the signal like the example of drawing_6 is explained. Drawing_12 is drawing showing roughly the configuration of the important section of the regenerative apparatus of the hologram card 10 shown in drawing_6. The truth-or-falsehood judging code read means 71 for a regenerative apparatus 70 to read the above-mentioned truth-or-falsehood judging code X in the data storage area of the hologram card 10, as shown in this drawing, The truth-or-falsehood judging code read means 72 for reading the above-mentioned truth-or-falsehood judging code Y. It consists of the function processing means 51 which carries out function processing of the truth-or-falsehood judging code X, a collating means 73 to collate $f(X)$ and the truth-or-falsehood judging code Y which were obtained by carrying out function processing, and to output a coincidence inequality, and the microcomputer 25 which contained RAM25B. And according to directions of the microcomputer 25 which contained RAM25B, reading appearance of the data A and B is carried out like drawing_10.

[0050] Next, actuation of a regenerative apparatus 70 is explained. First, with the truth-or-falsehood judging code read means 71, the truth-or-falsehood judging code X is read, and the truth-or-falsehood judging code Y is continuously read by the truth-or-falsehood judging code read means 72. With the function processing means 51, the truth-or-falsehood judging code X is inputted, processing is performed like the function processing means 51 of drawing 7, and function $f(X)$ is outputted. And $f(X)$ and the truth-or-falsehood judging code Y are inputted into the collating means 73, and it collates whether two codes are in agreement. If it is collating, it judges with the Shinsei article, and or it is not in agreement, the case where one side is not able to be read will be judged to be a counterfeit. And a judgment result is sent to a microcomputer 25 and written in RAM25B. A microcomputer 25 is restricted when the judgment written in RAM25B is Shinsei, Data A or B is reproduced, and playback is performed with reference to RAM25B. Thus, the data recorded through truth-or-falsehood judging processing are outputted.

[0051] In addition, although it explained that a truth-or-falsehood judging was performed by referring to two codes in a card, this invention is not restricted to this. For example, the truth-or-falsehood judging code Y is beforehand written in another memory in a microcomputer 25, and you may make it judge with the Shinsei article by coincidence of three persons. If it does in this way, it cannot be overemphasized that the forged prevention effectiveness increases further. Moreover, although function processing of the truth-or-falsehood judging code X was carried out, it may be made to carry out a truth-or-falsehood judging through processing of reverse. For example, inverse function processing $f^{-1}(Y)$ and X of the truth-or-falsehood judging code Y may be collated.

[0052]

[Effect of the Invention] Since according to the card mold hologram record medium of this invention, and its regenerative apparatus data are in the card mold record medium optically recorded by the hologram in which read is possible, prepare the 2nd [or more] page of an information recording surface in the thickness direction and recorded information on each information recording surface as explained above, not only alteration prevention but forged prevention can be performed, and it can consider as the high hologram card system of secrecy nature.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the sectional view showing the configuration of the conventional optical card.

[Drawing 2] It is the sectional view showing the fundamental configuration of the optical card which becomes this invention.

[Drawing 3] It is the sectional view showing other configurations of the optical card which becomes this invention.

[Drawing 4] It is the sectional view showing other configurations of the optical card which

becomes this invention.

[Drawing 5] It is the block diagram showing the recording apparatus of the optical card which becomes this invention.

[Drawing 6] It is the sectional view showing other configurations of the optical card which becomes this invention.

[Drawing 7] It is the block diagram showing the recording apparatus of other optical cards which become this invention.

[Drawing 8] It is the sectional view showing other configurations of the optical card which becomes this invention.

[Drawing 9] It is the sectional view showing other configurations of the optical card which becomes this invention.

[Drawing 10] It is the block diagram showing the regenerative apparatus of the optical card which becomes this invention.

[Drawing 11] It is the block diagram showing the important section configuration of the regenerative apparatus of the optical card which becomes this invention.

[Drawing 12] It is the block diagram showing the regenerative apparatus of other optical cards which become this invention.

[Description of Notations]

1A, 1B Information recording surface

2A, 2B Substrate

3A, 3B Recording layer

4A, 4B Protective layer

5 Transparency Resin Layer

A1, B1 Digital signal data

A2, B-2 Key information

25 Microcomputer

51 Function Processing Means

61 The Main Data Read Means

62 Key Information Read Means

63 Decryption Means

64 RAM

71 72 Truth-or-falsehood judging code read means

73 Collating Means